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(54) Fragrance releasing non-volatile polysiloxanes

(57) High molecular weight polydiorganosiloxane compounds of the general formula:

$M_aM'_a{}_aD_bD'_b{}_bT_cT'_c{}_cQ_dQ'_d{}_d$

where one or more of the organo substituents of the polymer is a radical derived from a fragrant alcohol impart desirable fragrant properties to silicone compositions used in cosmetics and other products where a long lasting slow release fragrance is desired when the fragrant radical is susceptible to hydrolysis releasing a fragrant alcohol.

The alcohols exemplified are phenethyl alcohol, decyl alcohol and 2,4-dimethyl-8-nonyl alcohol.

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FRAGRANCE RELEASING NON-VOLATILE POLYMERIC SILOXANES

The present invention relates to non-volatile oligomeric or polymeric siloxanes which may be linear, branched or cross-linked, suitable for use in a variety of applications including personal care formulations, house-hold products, automotive, textiles and molding materials wherein the non-volatile polymeric siloxane has been chemically modified to release a fragrant molecule upon hydrolysis. The present invention further relates to such molecules where the rate of fragrant molecule release is sufficiently slow so that products formulated with the modified polymeric non-volatile siloxane exhibit a desirable fragrance for long periods of time.

BACKGROUND OF THE INVENTION

The slow sustained release of a fragrant molecule is a highly desirable trait in many personal care products. A number of means have been proposed and implemented to achieve this goal. Among these means are dissolving or suspending fragrant compounds in personal care emulsions (U.S. patents 5,525,588; 5,525,555; 5,490,982; and 5,372,806), encapsulation of a fragrant compound (U.S. patents 5,500,223; 5,324,444; 5,185,155; 5,176,903; and 5,130,171), dissolving a fragrant compound into a hydrophobic phase

such as a silicone (U.S. patents 5,449,512; 5,160,494 and 5,234,689), incorporation of a fragrant compound into cross-linked polymers (U.S. patents 5,387,622 and 5,387,411), incorporation of fragrant compounds into permeable laminates (U.S. patents 5,071,704 and 5,008,115), incorporation of fragrant compounds into matrices that soften at body temperature (U.S. patent 4,908,208), incorporation of fragrant compounds into rate controlling membranes (U.S. patent 4,445,641) and derivatization of silanes with fragrant alcohols to form alkoxy silanes (U.S. patents 4,524,018 and 4,500,725). All of these approaches suffer from one or more of the following problems: 1) the material is not stable in a personal care formulation, 2) the material is not easy or convenient to prepare, or 3) the material does not release the fragrant compound in a slow and sustained fashion.

SUMMARY OF THE INVENTION

We now disclose a non-volatile silicone having the formula:

$$M_aM'_{a'}D_bD'_{b'}T_cT'_{c'}Q_d$$

where M and M′ have the formula $R^1R^2R^3SiO_{1/2}$; D and D′ have the formula $R^4R^5SiO_{2/2}$; T and T′ have the formula $R^6SiO_{3/2}$; and Q has the formula $SiO_{4/2}$ where R^1, R^2, R^3, R^4, R^5 and R^6 are each independently selected for each M, M′, D, D′, T and T′ from the group of one to forty carbon atom monovalent alkyl or alkoxy radicals and one to forty carbon atom monovalent aryl or aryloxy radicals, subject to the limitation that at least one of R^1, R^2, R^3, R^4, R^5 and R^6 is an alkyloxy or aryloxy radical that forms a fragrant alcohol upon hydrolysis of said silicone where the subscripts a or a′ are positive, and one or more of the subscripts b, b′, c, c′ or d are positive. This non-volatile silicone undergoes a slow hydrolysis under most conditions of use whereby the silicone releases a fragrant alcohol upon hydrolysis. This imparts a desirable odor to many different useful compositions such as cosmetics and household products.

The compositions of the present invention further provide that the fragrance releasing silicone have one or more substituents R^1, R^2, R^3, R^4, R^5 and R^6 where each substituent is independently selected whereby one fragrant alcohol resulting from hydrolysis of said silicone is selected from the group consisting of 2-methylbutanol, 3-pentanol, n-pentanol, 2-pentanol, n-hexanol, 2-methylpentanol, 1-decanol, sandela, nonadyl, dimetol, thymol, 1-heptanol, menthol, eugenol, vanillan, o-vanillan, 4-(*p*-hydroxyphenyl)-2-butanone, syringealdehyde, prenol, *cis*-3-hexanol, trans-3-hexanol, *cis*-4-heptenol, *trans*-2-octenol, *trans*-2-*cis*-6-nonadienol, geraniol, nerol, ebanol, citronellol, crotyl alcohol, oleyl alcohol, linalool, α-terpineol, β-phenethyl alcohol, cinnamic alcohol, benzyl alcohol, α -methylbenzyl alcohol, nonyl alcohol, 1-octanol, 3-octanol, phenethyl salicylate, hydrocinnamyl alcohol, *cis*-6-nonen-1-ol, *trans*-2-nonen-1-ol, methyl salicylate, *cis*-3-octen-ol, anisyl alcohol, carvacrol, dihydrocarveol, benzyl salicylate, tetrahydrogeraniol, ethyl salicylate, ethyl vanillin, isoeugenol, isopulegol, lauryl alcohol, tetrahydrolinalool and 2-phenoxyethanol.

DETAILED DESCRIPTION OF THE INVENTION

A silicone oligomer, polymer or copolymer that is non-volatile is substituted with alkoxysilane groups that are susceptible of hydrolysis releasing a fragrant alcohol upon hydrolysis. There is thus provided a material of the general formula:

$M_aD_bT_cQ_d$

where the subscript a is a positive number and the subscripts b, c and d are zero or positive numbers subject to the limitation that one of b, c and d is not zero where

$M = R^1R^2R^3SiO_{1/2}$;

$D = R^4R^5SiO_{2/2}$;

$T = R^6SiO_{3/2}$; and

$Q = SiO_{4/2}$

where R^1, R^2, R^3, R^4, R^5 and R^6 are each independently selected for each M, D and T from the group of one to forty carbon atom monovalent alkyl or alkoxy radicals and one to forty carbon atom monovalent aryl or aryloxy radicals, subject to the limitation that at least one of R^1, R^2, R^3, R^4, R^5 and R^6 is an alkyloxy or aryloxy radical that forms a fragrant alcohol upon hydrolysis of the siloxane. By non-volatile, Applicants stipulate that the oligomer, polymer or copolymer must have a molecular weight in excess of from about 250 to about 300,000; preferably from about 500 to about 100,000; more preferably from about 750 to about 20,000; and most preferably from about 1000 to about 10,000. Since it is well known that molecular weight and viscosity of silicone compounds is reasonably well-correlated, the viscosity of these compounds thus ranges from about 2 to about 600,000 centistokes at 25 °C; preferably from about 4 to about 60,000 centistokes at 25 °C; more preferably from about 5 to about 750 centistokes at 25 °C; and most preferably from about 10 to about 250 centistokes at 25 °C. Since the compounds of the present invention may be copolymers, more than one M, D, or T group is contemplated by the general formula above. Thus

$M_aM'_{a'}D_bD'_{b'}T_cT'_{c'}Q_d$

where the formulas for M′, D′ and T′ conform to the previous general definition but the respective R groups are different. In the case of linear copolymers, the subscripts a or a′ and b or b′ must be non-zero and positive in order to produce a copolymer. For branched species, one of c, c′ or d must be non-zero and positive. Higher order copolymers and branched species are possible as well. When the specific formula describing a fragrant silicone includes either T or Q groups, non-linear molecules result with the consequence that a fragrant gel or elastomer results. Applicants note that for specific molecules the values of the subscripts will be integral and positive when the subscripts assume non-zero values and when the preparations yield

complex mixtures of oligomeric or polymeric species the values of the subscripts will not be necessarily be integral although they will be positive if they are not zero.

Thus the compounds of the present invention:

$(R^1R^2R^3SiO_{1/2})_a(R^4R^5SiO_{2/2})_b(R^6SiO_{3/2})_cQ_d$

must undergo one of the three following hydrolysis reactions:

$(R^1R^2R^3SiO_{1/2})_a(R^4R^5SiO_{2/2})_b(R^6SiO_{3/2})_cQ_d + H_2O \rightarrow (HOR^2R^3SiO_{1/2})_a(R^4R^5SiO_{2/2})_b(R^6SiO_{3/2})_cQ_d + R^1OH$ 1)

$(R^1R^2R^3SiO_{1/2})_a(R^4R^5SiO_{2/2})_b(R^6SiO_{3/2})_cQ_d + H_2O \rightarrow (R^1R^2R^3SiO_{1/2})_a(HOR^5SiO_{2/2})_b(R^6SiO_{3/2})_cQ_d + R^4OH$ 2)

$(R^1R^2R^3SiO_{1/2})_a(R^4R^5SiO_{2/2})_b(R^6SiO_{3/2})_cQ_d + H_2O \rightarrow (R^1R^2R^3SiO_{1/2})_a(R^4R^5SiO_{2/2})_b(HOSiO_{3/2})_cQ_d + R^6OH$ 3)

where R^1OH, R^4OH, and R^6OH are fragrant alcohols, designated FragOH, where the abbreviation Frag indicates a fragrant structural moiety, i.e. a fragrance imparting monovalent organic radical. It is to be noted that the specific radicals, R, have been selected only for purposes of illustrating the three hydrolysis reactions and are examples only from which no limitations should be inferred. It should also be noted that while the limiting condition is that one of R^1, R^2, R^3, R^4, R^5 and R^6 is a fragrant alkyloxy or aryloxy moiety more than one R^1, R^2, R^3, R^4, R^5 and R^6 may be a fragrant moiety or mixtures thereof.

The compounds of the present invention are conveniently prepared by a variety of routes as outlined below. The fragrant alcohol may react with an alkoxy precursor, a chlorosilane, a silicic acid, a silanol, a silyl vinylether, a silyl ketoxime, a silazane or a cyclic siloxane.

"Si"-OR + Frag-OH → "Si"-OFrag

"Si"-Cl + Frag-OH → "Si"-OFrag

"Si"-OOCR + Frag-OH → "Si"-OFrag

"Si"-OH + Frag-OH → "Si"-OFrag

"Si"-O-CH=CH-R + Frag-OH → "Si"-OFrag

"Si"-O-N=CR_2 + Frag-OH →"Si"-OFrag

"Si"-NR_2 + Frag-OH → "Si"-OFrag

"Si"-O (cyclic) + Frag-OH → "Si"-OFrag,

where "Si" indicates a generic silicone moiety and Frag indicates a fragrance imparting organic radical.

The compounds of the present invention were prepared by the base catalyzed equilibration of alkoxy precursor compounds in the presence of the particular fragrant alcohol of choice. Thus the synthesis reaction proceeds by alkoxy exchange conditions that preferably remove the non-fragrant alcohol reaction product from the reaction mixture. The synthesis reaction is actually the reverse of the hydrolysis reaction, reactions 1), 2) and 3) conducted in the presence of a suitable catalyst. Since the compounds of the present invention are hydrolyzable, it is preferred that synthesis conditions are as nearly anhydrous as possible to minimize premature hydrolysis of the fragrance containing silicone so produced. While base catalyzed alkoxy or aryloxy exchange is one means of preparing the fragrant compounds of the present invention other synthetic techniques known in the art may be employed as long as particular care is taken to avoid premature hydrolysis of the resulting fragrance releasing oligomer, polymer or copolymer. Thus for example, the fragrant alcohol may be reacted with an alkyl alkoxy silane, an aryl alkoxy silane, an alkyl aryloxy silane or an aryl aryloxy silane in the presence of base to prepare a silane where the alkyloxy or aryloxy groups are the fragrant moieties. These compounds are then reacted in the presence of a cyclic siloxane or mixture thereof with an appropriate polymerization catalyst to prepare the fragrance functionalized silicones of the present invention. By way of illustrative example with R^3OH a fragrant alcohol:

$$R^1_2Si(OR^2)_2 + 2R^3OH \rightarrow R^1_2Si(OR^3)_2 + 2R^2OH \quad 4)$$

$$R^1_2Si(OR^3)_2 + (R^4R^5SiO_{2/2})_{3,4,\text{or }5} \xrightarrow{\text{catalyst}} (R^1_2(OR^3)SiO_{3/2})(R^4R^5SiO_{2/2})_b(R^4R^5(OR^3)SiO_{3/2}) \quad 5)$$

In this reaction scheme, it is to be noted that one of the D groups of the cyclic compound is converted to a different M group where the R groups originally on the D are now R groups on M' (This explains the use of R^4 and R^5 in a formula for M in contrast to the definitions previously stipulated).

The exchange reaction to prepare the compounds of the present invention is conducted in the presence of a fragrant alcohol R^1OH, R^4OH, R^6OH or mixtures thereof or silane derivatives of the fragrant alcohol. By reference to the products of reactions 1), 2) and 3), the fragrant alcohol(s) R^1OH, R^4OH, and R^6OH or mixtures thereof or silane derivatives thereof are added to an alkoxy stopped or alkoxy on chain silicone and reacted in the presence of a catalyst, preferably either an acidic or basic catalyst. The acid catalysts may be selected from, but are not limited to trifluoroacetic acid, trifluoroacetic acid/sodium acetate, para-toluenesulfonic acid, HCl, acetic acid and acid washed clay. The base catalyst can be selected from the group consisting of sodium hydroxide, sodium silanolate, potassium hydroxide, potassium silanolate, tetrabutylammonium hydroxide, tetrabutylammonium silanolate, tetramethylammonium hydroxide, tetramethylammonium silanolate, tetrabuylphosphonium hydroxide and tetrabuylphosphonium silanolate at temperatures ranging from about 30 to about 150 °C; preferably from about 40 to about 140 °C; more preferably from about 50 to about 130 °C; and most preferably from about 60 to about 120 °C.

The fragrant alcohols R^1OH, R^4OH, and R^6OH or mixtures thereof are selected from those alcohols exhibiting a desired fragrance. More particularly, the fragrant alcohols may be selected from the group consisting of 2-methylbutanol, 3-pentanol, n-pentanol, 2-pentanol, n-hexanol, 2-

methylpentanol, 1-decanol, sandela, nonadyl, dimetol, thymol, 1-heptanol, menthol, eugenol, vanillan, o-vanillan, 4-(*p*-hydroxyphenyl)-2-butanone, syringealdehyde, prenol, *cis*-3-hexanol, trans-3-hexanol, *cis*-4-heptenol, *trans*-2-octenol, *trans*-2-*cis*-6-nonadienol, geraniol, nerol, ebanol, citronellol, crotyl alcohol, oleyl alcohol, linalool, α-terpineol, β-phenethyl alcohol, cinnamic alcohol, benzyl alcohol, α -methylbenzyl alcohol, nonyl alcohol, 1-octanol, 3-octanol, phenethyl salicylate, hydrocinnamyl alcohol, *cis*-6-nonen-1-ol, *trans*-2-nonen-1-ol, methyl salicylate, *cis*-3-octen-ol, anisyl alcohol, carvacrol, dihydrocarveol, benzyl salicylate, tetrahydrogeraniol, ethyl salicylate, ethyl vanillin, isoeugenol, isopulegol, lauryl alcohol, tetrahydrolinalool and 2-phenoxyethanol.

The fragrance releasing compounds of the present invention are particularly suited to incorporation into personal care products to impart a desirable long lasting fragrance to the products. Suitable uses include but are not limited to deodorants, antiperspirants, skin creams, facial creams, hair care products such as shampoos, mousses, styling gels, protective creams, shaving creams, after shave, cologne, perfume, color cosmetics such as lipsticks, foundations, blushes, makeup, and mascara; and other cosmetic formulations where silicone components have been added and where it is desirable to impart a fragrance. Incorporation of small amounts of the compositions of the present invention into fragrance products such as shaving lotions, colognes, toilet water, and perfumes can impart a desirable long lasting fragrance to these products. Further, the silicones of the present invention may incorporated into other products where it is desirable to mask unpleasant odors with a pleasant fragrance for example household cleaning products such as waxes and polishes, automobile cleaning products such as waxes and polishes, detergents, paints, varnishes and the like subject to the limitation that the silicone of the present invention be compatible or capable of being rendered compatible with the product in which it is incorporated.

EXPERIMENTAL

Preparation of Dimethylbis(2-phenethyloxy)silane:

To a 100 mL 3-neck round bottom flask equipped with a magnetic stirring bar, a thermometer, condenser and nitrogen inlet was charged 10.0 g dimethyldimethoxysilane (0.083 moles), 10.16 g phenethyl alcohol (0.083 moles) and 5 mg potassium hydroxide. The reaction mixture was stirred for 17 hours followed by heating to 80 °C and subjected to vacuum stripping at 95 °C and 15 mm Hg total pressure to yield 12.6 of product that was 76% pure as analyzed by gas chromatography.

Preparation of Polydimethylsiloxane Chainstopped with Phenethyloxy Groups:

70.0 g of octamethyltetrasiloxane, 1.0 g dimethylbis(2-phenthyloxy)silane (as previously prepared) and 0.7 g of potassium silanolate were combined in a 250 mL 3-neck round bottom flask equipped with a mechanical stirrer, a thermometer, a condenser and a nitrogen inlet. The reaction mixture was heated to 150 °C and allowed to react for 4 hours and then cooled to 50 °C. 40 µL of glacial acetic acid was then added and the mixture was stirred for an additional 30 minutes, after which the mixture was recovered and filtered through Celite™. The resulting product mixture contained approximately 13 weight percent of the starting cyclic tetramer and a polymeric product that had a weight average molecular weight of 38,250 and a number average molecular weight of 14,500.

Preparation of Dimethyldecyloxysilane:

To a 100 mL 3-neck round bottom flask equipped with a magnetic stir bar, a thermometer, a condenser, and a nitrogen inlet was charged 7.55 g dimethyldimethoxysilane (0.062 moles), 20.0 g decyl alcohol (0.13 moles) and 15 mg potassium hydroxide. The mixture was heated to 80 °C with periodic application of a slight vacuum to remove by-product methanol. At reaction completion, determined by gas chromatographic analysis, the reaction

mixture was vacuum stripped at 100-110 °C at 10-12 mm Hg total pressure yielding 7.1 g of a product that was 85 % pure by gas chromatography. The product was decolorized by treating with decolorizing charcoal.

Preparation of Polydimethylsiloxane Chainstopped with Decyloxy Groups:

70.0 g of octamethyltetrasiloxane, 7.1g of dimethyldidecyloxysilane and 0.77g potassium silanolate were combined in a 250 mL 3-neck round bottom flask equipped with a mechanical stirrer, a thermometer, a condenser, and a nitrogen inlet. The reaction mixture was heated to 150 °C and allowed to react for 4.5 hours and then cooled to 50 °C. 50 µL of glacial acetic acid was then added and the mixture was stirred for an additional 30 minutes, after which the mixture was recovered and filtered through Celite™. The resulting product mixture contained approximately 14 weight percent of the starting cyclic tetramer and a polymeric product that had a weight average molecular weight of 8,600 and a number average molecular weight of 4,600.

Preparation of Dimethylbis(2,4-dimethyl-8-nonoxy)silane:

To a 100 mL 3-neck round bottom flask equipped with a magnetic stirring bar, a thermometer, a condenser and a nitrogen inlet was charged 6.98 g of dimethyldimethoxysilane (0.058 moles), 20.0 g 2,4-dimethyl-8-hydroxynonane (0.116 moles) and 20 mg potassium hydroxide. The mixture was heated to 70 °C with periodic application of a slight vacuum to remove by-product methanol. At reaction completion, determined by gas chromatographic analysis, the reaction mixture was vacuum stripped at 90 °C at 6 mm Hg total pressure yielding 13.5 g of a product that was 78 % pure by gas chromatography. The product was decolorized by treating with decolorizing charcoal.

Preparation of Polydimethylsiloxane Chainstopped with 2,4-dimethyl-8-nonoxy Groups:

7.6 g of octamethyltetrasiloxane, 7.6 g of dimethylbis(2,4-dimethyl-8-nonoxy) silane and 0.77 g potassium silanolate were combined in a 250 mL 3-

neck round bottom flask equipped with a mechanical stirrer, a thermometer, a condenser and a nitrogen inlet. The reaction mixture was heated to 150 °C and allowed to react for 6 hours and then cooled to room temperature. 70 μL of glacial acetic acid was then added and the mixture was stirred for an additional 30 minutes, after which the mixture was recovered and filtered through Celite™. The resulting product mixture contained approximately 14 weight percent of the starting cyclic tetramer and a polymeric product that had a weight average molecular weight of 9,200 and a number average molecular weight of 4,900.

Hydrolysis of Polydimethylsiloxane Chainstopped with Phenethyloxy Groups.

0.5 g of the polydimethylsiloxane chainstopped with phenethyloxy groups (as previously prepared) was dissolved in 1.3 g tetrahydrofuran into which 100 μL of water was added. Gas chromatographic analysis both before the reaction and after 18 hours of stirring at ambient conditions that the amount of phenethyl alcohol present in the tetrahydrofuran solution had risen from 0.3 area percent to 3.9 area percent.

Hydrolysis of Polydimethylsiloxane Chainstopped with Decyloxy Groups:

0.21 of the polydimethylsiloxane chainstopped with decyloxy groups (as previously prepared) was dissolved in 1.0 g tetrahydrofuran and then treated with 100 μL of deionized water and 20 μL of glacial acetic acid. Aliquots were removed at periodic intervals and analyzed by gas chromatography. The release profile for the fragrant alcohol from the polymer is shown in Table 1.

Table 1: Release Profile for Decyl Alcohol from Polydimethylsiloxane Chainstopped with Decyloxy Groups

Time (hours)	Decyl Alcohol Concentration in Tetrahydrofuran Solution (Gas Chromatographic Area Percent)
0.00	0.121
0.670	0.134
2.50	0.164
4.67	0.183
6.40	0.197
21.7	0.332
27.7	0.378
47.0	0.509
118.0	0.800
132.0	0.773
156.0	0.890
180.0	0.919
204.0	0.925

These data demonstrate slow release of a fragrant alcohol by hydrolysis of a siloxane polymer chainstopped with a fragrant alcohol condensation product.

Claims

1. A non-volatile silicone having the formula:

$$M_aM'_{a'}D_bD'_{b'}T_cT'_{c'}Q_d$$

where M and M′ have the formula $R^1R^2R^3SiO_{1/2}$; D and D′ have the formula $R^4R^5SiO_{2/2}$; T and T′ have the formula $R^6SiO_{3/2}$; and Q has the formula $SiO_{4/2}$ where R^1, R^2, R^3, R^4, R^5 and R^6 are each independently selected for each M, M′, D, D′, T and T′ from the group of one to forty carbon atom monovalent alkyl or alkoxy radicals and one to forty carbon atom monovalent aryl or aryloxy radicals, subject to the limitation that at least one of R^1, R^2, R^3, R^4, R^5 and R^6 is an alkyloxy or aryloxy radical that forms a fragrant alcohol upon hydrolysis of said silicone where the subscripts a or a′ are positive, and one or more of the subscripts b, b′, c, c′ or d are positive.

2. The silicone of claim 1 where b or b′ is positive.

3. The silicone of claim 2 where c, c′ and d are zero.

4. The silicone of claim 2 where c or c′ is positive.

5. The silicone of claim 2 where c or c′ and d are positive.

6. The silicone of claim 2 where c and c′ are zero and d is positive.

7. The silicone of claim 1 where b and b′ are zero.

8. The silicone of claim 7 where c or c′ is positive.

9. The silicone of claim 7 where c or c′ and d are positive.

10. The silicone of claim 1 where b, b′, c and c′ are zero and d is positive.

11. The silicone of claim 1 where one or more of R^1, R^2, R^3, R^4, R^5 and R^6 is each independently selected whereby one fragrant alcohol resulting from hydrolysis of said silicone is selected from the group consisting of 2-methylbutanol, 3-pentanol, n-pentanol, 2-pentanol, n-hexanol, 2-methylpentanol, 1-decanol, sandela, nonadyl, dimetol, thymol, 1-heptanol, menthol, eugenol, vanillan, o-vanillan, 4-(*p*-hydroxyphenyl)-2-butanone, syringealdehyde, prenol, *cis*-3-hexanol, trans-3-hexanol, *cis*-4-heptenol, *trans*-

2-octenol, *trans*-2-*cis*-6-nonadienol, geraniol, nerol, ebanol, citronellol, crotyl alcohol, oleyl alcohol, linalool, α-terpineol, β-phenethyl alcohol, cinnamic alcohol, benzyl alcohol, α -methylbenzyl alcohol, nonyl alcohol, 1-octanol, 3-octanol, phenethyl salicylate, hydrocinnamyl alcohol, *cis*-6-nonen-1-ol, *trans*-2-nonen-1-ol, methyl salicylate, *cis*-3-octen-ol, anisyl alcohol, carvacrol, dihydrocarveol, benzyl salicylate, tetrahydrogeraniol, ethyl salicylate, ethyl vanillin, isoeugenol, isopulegol, lauryl alcohol, tetrahydrolinalool and 2-phenoxyethanol.

12. The silicone of claim 1 wherein said silicone has a molecular weight ranging from about 250 to about 300,000.

13. The silicone of claim 1 wherein said silicone has a viscosity ranging from about 2 to about 600,000 centistokes at 25 °C.

14. A cosmetic or personal care composition comprising a non-volatile silicone having the formula:

$$M_aM'_{a'}D_bD'_{b'}T_cT'_{c'}Q_d$$

where M and M′ have the formula $R^1R^2R^3SiO_{1/2}$; D and D′ have the formula $R^4R^5SiO_{2/2}$; T and T′ have the formula $R^6SiO_{3/2}$; and Q has the formula $SiO_{4/2}$ where R^1, R^2, R^3, R^4, R^5 and R^6 are each independently selected for each M, M′, D, D′, T and T′ from the group of one to forty carbon atom monovalent alkyl or alkoxy radicals and one to forty carbon atom monovalent aryl or aryloxy radicals, subject to the limitation that at least one of R^1, R^2, R^3, R^4, R^5 and R^6 is an alkyloxy or aryloxy radical that forms a fragrant alcohol upon hydrolysis of said silicone where the subscripts a or a′ are positive, and one or more of the subscripts b, b′, c, c′ or d are positive.

15. The cosmetic or personal care composition of claim 14 wherein said cosmetic or personal care composition is selected from the group consisting of deodorants, antiperspirants, skin creams, facial creams, shampoos, mousses, styling gels, protective creams, shaving creams, after shave, cologne, perfume, lipsticks, foundations, blushes, makeup, and mascara.

16. A silicone composition comprising a non-volatile silicone having the formula:

$$M_aM'_{a'}D_bD'_{b'}T_cT'_{c'}Q_d$$

where M and M′ have the formula $R^1R^2R^3SiO_{1/2}$; D and D′ have the formula $R^4R^5SiO_{2/2}$; T and T′ have the formula $R^6SiO_{3/2}$; and Q has the formula $SiO_{4/2}$ where R^1, R^2, R^3, R^4, R^5 and R^6 are each independently selected for each M, M′, D, D′, T and T′ from the group of one to forty carbon atom monovalent alkyl or alkoxy radicals and one to forty carbon atom monovalent aryl or aryloxy radicals, subject to the limitation that at least one of R^1, R^2, R^3, R^4, R^5 and R^6 is an alkyloxy or aryloxy radical that forms a fragrant alcohol upon hydrolysis of said silicone where the subscripts a and a′ are non-zero and positive, and one or more of the subscripts b, b′, c, c′ or d are non-zero and positive.

17. The silicone of claim 16 where b or b′ is positive and c, c′, and d are zero.

18. The silicone of claim 16 where b or b′ and d are positive and c and c′ are zero.

19. The silicone of claim 16 where b or b′ and c or c′ are positive and d is zero.

20. The silicone of claim 16 where b, b′, c, and c′ are zero and d is positive.

Patent Office

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Application No: GB 9724052.7 **Examiner:** Diane Davies
Claims searched: 1-20 **Date of search:** 3 February 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): C3T: TSAA

Int Cl (Ed.6): C08G 77/18

Other: Online: CAS-ONLINE, EDOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	WO 9628497 A	(Firmenich SA) Whole document: polysiloxanes containing alcohols which act as active frangnaces for use in consumer goods.	1-20
X	GB 2041964 A	(Dow Corning Ltd.) Whole document: soap compositions containing a polysiloxane having an alkoxy group derived from a perfume alcohol.	1-20
X	US 3271305 A	(Dan River Mills Inc.) Treating textiles with fragrance-containing siloxanes (see column 2 lines 6 to 17) having	At least claim 1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.